



Non-Destructive Examination and Assay of Drums Containing Transuranic Waste



Developer: Bio-Imaging Research, Inc.
Contract Number: DE-AC21-96MC33127
Crosscutting Area: CMST

Mixed Waste
 FOCUS AREA

Problem:

Characterization of contents of nuclear waste drums is required for disposition decisions, safe transportation, treatment, and permanent storage. The movement of retrievable drums on and off temporary storage sites is regulated for safety and environmental reasons. Examination of the contents is expensive, because of safety precautions necessary when handling nuclear waste.

Currently nondestructive examination (NDE) techniques such as real-time radiography (RTR) lack capabilities for measuring free liquid volumes and nondestructive assay (NDA) techniques such as segmented gamma scanning (SGS) lack the ability to determine total gram equivalent of Plutonium-239 (^{239}Pu) for the variety of nuclear waste matrices with low-level gamma emissions from transuranic waste.

Solution:

This project integrates and demonstrates the results of two semitrailer based mobile inspection systems including: Waste Inspection Tomography (WIT) manufactured by Bio-Imaging Research, Inc. (BIR)

and the Active and Passive Neutron Examination and Assay System (APNEA) manufactured by Lockheed Martin Speciality Components (LMSC). Together, these systems provide both NDE and NDA capabilities that include a multimodality approach to noninvasive nuclear waste drum characterization for transuranic waste. This development effort integrates characterization data from x-ray, gamma emission, and neutron inspection systems to provide characterization data of transuranic waste.

Benefits:

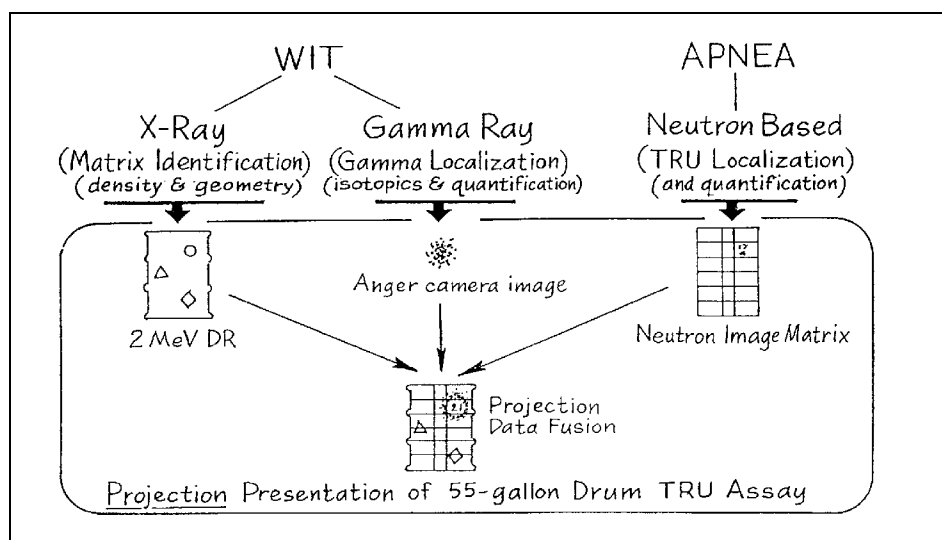
►Rapid characterization of 55-110 gallon drums for radioactive and waste matrix content and

localization including heavy metals, wall thickness, free liquid volume, and location

►Effective for low level, transuranic, and mixed wastes in a variety of matrices including cement, glass polymers, combustibles, loose soils, heterogenous metals, and super compacted materials. The significant benefit is that the integration of WIT and APNEA data provides assay capability for both weak and strong gamma emitting waste in a variety of waste matrices

►Mobile systems optimize logistics

►Projects, Slices, and 3-D volume renderings of data fused images from x-ray, gamma emission, and neutron based data in near real-time provides



for imaging drum contents for ready interpretation to facilitate evaluation, processing and disposition of drums

►Archived data can support engineering decisions and regulatory compliance by providing integrated reporting of x-rays, gamma, and neutron data to meet regulated waste acceptance criteria reporting

Technology:

Measured emissions from TRU are known to be low gamma emitters. Neutron based systems are known to be able to assay low gamma emission drums. They require both matrix and geometry corrections in addition to isotopic data. WIT and APNEA alone cannot provide this data. However, the integration of WIT and APNEA can overcome these problems. WIT provides waste matrix geometry, and attenuation information as well as gamma isotropics and gamma tomography assays, while at the same time, APNEA can provide WIT with neutron assay information from drums that are poor gamma emitters. This combination can provide for complete noninvasive NDE/NDA from integrated mobile platforms. This integrated approach meets waste acceptance requirements for transuranic waste by providing the total gram equivalent of ^{239}Pu for an entire waste drum with attenuation corrections based on matrix type and distribution.

Contacts:

BIR is an industrial CT manufacturer and the WIT contractor for the Department of Energy (DOE). For

information on this project, the contractor contact is:

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DOE's Federal Energy Technology Center supports the Environmental Management - Office of Science and Technology by contracting the research and development of new technologies for waste site characterization and cleanup. For information regarding this project, the DOE contact is:

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